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Keywords
Six Sigma, higher education, improvements

THE INDUSTRIAL REVOLUTION OF HIGHER EDUCATION

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Abstract

For generations, higher education has accommodated its scholars through analog forms of instruction akin to blackboards and textbooks. As society blossomed into a globalized marketplace with information readily available at the stroke of a button, higher education has had to meet the needs of an evolving student population. Through the use of business models like Six Sigma, higher education has attempted to adapt and keep up with the times. This article will highlight the key impacts Six Sigma has had on higher education and supplementary improvements needed within the marketplace.

Keywords: *Six Sigma, higher education, improvements*

Introduction

Education is defined in several different ways; however, the role of education as simply enhancing knowledge appears to be the only common definition. The difference between the reason for education and the way education works is key to understanding what education really is. There is a common belief that the objective of education is to transmit knowledge from the instructor to the learner (Callaway, 1979). Finally, the function of education is the dissemination of knowledge from the classroom to the global marketplace, which occurs as a result of the learner having obtained that knowledge (Callaway, 1979).

Education has taken many forms over the years. Storytelling was among the earliest forms of passing down information from one person or group to another and one generation to another (Ritchie, 2003). As societies grew and became more complex, so did educational institutions, to the point that they are now large and complex entities. To understand this evolution, it is possible to identify milestones starting with the earliest colleges and universities and following the progression through to today's system of higher education.

History of Higher Education

The development of people and their culture was facilitated by society transmitting knowledge from one generation to another. In the earliest societies this transmission of knowledge was done orally and through imitation (Ritchie, 2003). As society progressed it became more complex and so did learning. The earliest recorded formal education occurred in the early Middle Ages and consisted primarily of monasteries training young men for the priesthood. Cathedral schools began during the 12th century and served as the training ground for the church and government workers (Penner, 1998).

By the early to mid-12th century, colleges and universities became more important when it became clear that the way individuals had been educated, through monasteries and cathedral schools (Penner, 1998), was no longer able to serve society because of society's increasingly more complex nature. The concept of higher education emerged and colleges and universities

were founded. The earliest universities to develop were in Italy, at Salerno in the 9th century and the University of Bologna at the beginning of the 12th century, followed in the middle of the century by the University of Paris in France, and Oxford University in England (Penner, 1998).

The Latin term *universitas* originally referred to any community or corporation but was later used as a way to refer to a student body. Universities started as scholastic guilds and later as centers of learning, each modeled after early-established institutions, such as Oxford and Cambridge (Penner, 1998). According to Penner (1998), universities first began in earnest during the 12th and 13th centuries primarily to train lawyers, doctors, and ministers. Some of these early schools concentrated on certain specialties. Salerno and Montpelier, for example, were known for training doctors, Bologna for training lawyers, and theologians were educated at Paris (Penner, 1998).

Many of the earliest universities in Europe came about as a result of the king or by some legislative (for example Parliament) initiative, and some by actions of the students themselves, such as through migrations of students from other schools (Rashdall, 1936). One example of such migration can be seen in the history of institutions like Oxford University, which was founded by English students from the University of Paris who were forced to leave Paris as a result of conflicts between England and France. A second is a university at Lipzig, which was founded in the 15th century by German scholars who were driven out of Prague by John Huss's Czech national movement (Rashdall, 1936).

The 13th century saw a spurt of new colleges and universities in Europe. Salamanca University was established in Spain during 1217, while University College and Balliol College, both in Oxford, England, were founded in 1249 and 1263, respectively (Cohen, 1998). These schools were followed by the founding in 1290 of the University of Lisbon in Portugal and the University of Edinburgh, which did not occur until the late 16th century. Cohen (1998) posited that the first colleges did not appear on the American landscape until the 1600s with the establishment of Harvard College in Cambridge, Massachusetts, in 1636. It would be 57 years before the next United States collegiate institution was born, the College of William and Mary in Virginia in 1693 (Cohen, 1998).

Like universities, colleges first emerged on the higher education landscape in the Middle Ages, around the 12th century. "It was in England, at Oxford and Cambridge, that the college became the principal center of learning, with the university serving mainly to examine candidates and confer degrees" (Cohen, 1998, p. 17). Cohen (1998) noted that separate technical colleges were founded after the Industrial Revolution, which heightened the demand for scientific and technical education.

The first liberal arts colleges began in the United States in the 17th and 18th centuries. Many of them were founded by religious organizations mainly for training young men for the ministry. Rashdall (1936) and Cohen (1998) indicated that Harvard was established by the Puritans, William and Mary was founded by the Anglicans, Yale by the Congregationalists, Columbia by the Anglican church, and Brown was started by Baptists. The 19th century was a time when a number of women's colleges were born, such as Mt. Holyoke in 1837, Elmira in 1853, Vassar in 1861, and Wellesley and Smith in 1871 (Cohen, 1998). In addition, Cohen (1998) indicated that the 19th century also saw the birth and growth of teachers colleges or 'normal schools' as they were called at that time. The *Morrill Land Grant Acts* allowed for the creation of land-grant colleges, known as "Normal Colleges," which are presently the "primary educators of the American professional workforce" (Callan & Finney, 2002, p. 201). "Most were transformed into state colleges offering bachelor's degrees and eventually the master's for young

people who would become school teachers" (Cohen, 1998, p. 112). In addition, with the emergence of the *Morrill Land Grant Acts,* historically Black colleges and universities (HBCUs) were developed to provide people of color with secondary education along with the tools necessary to be successful in the fields of agriculture, teaching, and missionary work.

Since the birth of colleges and universities in the United States, there has been a virtual explosion of colleges and universities. By the beginning of the colonial period there were nine colleges and "by the 20th century, there were 3,700 accredited colleges and universities awarding associate or bachelor's degrees" (Cohen, 1998, p. 300). Cohen (1998) indicated that up to 50 percent of individuals in the United States enter some form of postsecondary education during their lifetime. Higher education contributes significantly to the economy of most nations as a result of the educational training it provides (Ewell, 1999). The role of higher education is an important element in increasing the number of professional and managerial experts. In addition, higher education equips our nation for global competitiveness (Nettles & Millett, 2006).

Like four-year institutions, community colleges are change agents in the edification and proliferation of communities. Through certifications and the provision of skilled laborers, products of community colleges have helped shape society and the economy since their manifestation in the early 1900s.

Emergence of Community Colleges

Community colleges are distinctive American institutions making higher education instruction possible for the larger community. They offer students the opportunity to attend school while living at home, schedules that work around family issues and jobs, with a focus on workforce-related curricula (McPhail, 2005). Community colleges offer courses leading to certificates and associate's degrees; these institutions were known as junior colleges and technical colleges in the early 1900s. Joliet Junior College was the first community college, established as an extension to a Joliet, Illinois high school in 1901 (Baker, 1994). During the 1920s and 1930s, community colleges served as the basis for workforce development by providing vocational training until after World War II (WWII) (Dougherty, 1994).

By the 1960s, there were more than 450 community colleges across the U.S. In addition to increased numbers, community colleges saw an increase in enrollment as a result of individuals trying to escape the draft for the Vietnam War (Baker, 1994). In the 1980s, community colleges partnered with high schools to help get their students ready for postsecondary educational programs. The name community college was later adopted because the students attending the institutions were generally from the local community and because the local community supported the college through property taxes (Frye, 1992).

Community colleges started out as two-year schools whose primary purpose has been to assist many students with the transition to four-year institutions. They also provided training for various technical and vocational programs. As a result of this change in nomenclature, the American Association of Junior Colleges (AAJC) changed its name to the American Association of Community Colleges (AACC) in 1992 (Baker, 1994). In recent history, scholars have found that community colleges provide the hope of college to those who might not have been afforded the opportunity to attend college (McPhail, 2005). Today, there are approximately 1,166 community colleges that assist in influencing communities to become change agents by educating students who would then provide for the employment needs of society (Baker, 1994).

While brick and mortar campuses have been around for hundreds of years, universities have sought new means to edify the masses. Through the use of computerized technology and branch locations, institutional outreach has now become globalized.

Emergence of Branch Campuses and Computerized Technology

In recent decade's colleges and universities across the country have reexamined efforts used in their student enrollment processes. To keep up with evolving student populations, a select number of institutions have looked into the development of branch campuses and computerized technologies to attract new scholars. Branch campuses are smaller factions of larger institutions that are oftentimes dispersed regionally, nationally, and/or globally. Branch institutions are accredited sites that typically provide its students with smaller classroom sizes (Grego, 2015) and select academic programming that sometimes differs from its main campus (Altbach, 2010).

Branch campuses have become new means for marketing institutions and generating revenue for both undergraduate and graduate programs. Branch campuses sites regularly provide executive style programming to accommodate non-traditional students and are model locations for students who are geographically restricted (Fonseca & Bird, 2007). What largely makes these sites ideal is that they require limited set-up, they are inexpensive to instruct (Altbach, 2010) and they can provide instruction to students who wish to transfer from a community college to a four-year institution within a particular commuting range (Fonseca & Bird, 2007). Computerized technology has prospered in recent decades as a result of the global shift from analog genuineness to electronic technologies (Clift, Liptak, & Rosen, 2016). Allen and Seamen (2013) indicate that nearly seventy percent of higher education institutions view online education in their long-term strategy. Online learning has made the world a little smaller thereby making physical sites antiquated as a result of cost-effectiveness, convenience, flexibility, and low cost for consumers (Clift, Liptak, & Rosen, 2016). For example, according to Clift, Liptak, and Rosen (2016), Massive Online Open Courses (MOOCs) have gained notoriety due to their format of providing access to education for tens of thousands of scholars along with feedback from evaluations. These new models of instruction have detached the physical restrictions of the classroom and have removed the deficit of traditional business models approaches to meeting the needs of the digital era.

The economics behind the globalization of academia is no longer a trend but the staunch reality of the 21st century (Altbach & Knight, 2007). While there are many upsides to branch campuses and computerized technologies, there are inherent risks associated with these platforms. Fonseca and Bird (2007) ascertain that branch campuses should not be "storefront operations" but rather permanent physical structures with residential faculty. Altbach (2010) concedes that dangers may even loom if financial damages occur, students receive inept service, or academic reputations are questioned. In addition, for branch campuses that are located internationally, conflicts may arise if political or social transitions transpire or if conflicting expectations occur between the university and host country (Altbach, 2011).

While computerized technologies could conceivably increase the productivity and internationalization of academia, Clift, Liptak, and Rosen (2016) proclaim that:

> No matter what delivery mechanism is used in a class, for example, instructors still have to ask whether students are improving their core competencies or simply absorbing content that could have been found elsewhere. Progressive education is only realized when individual learners are able to gain those transformative insights capable of yielding the thoughts and perspectives needed for social innovation to occur (p. 30).

Higher education is constantly looking at avenues to improve its product while maximizing profit. Traditional and competing business models have been used over the years to

address the desires of numerous stakeholders (Clift, Liptak, & Rosen, 2016), but novel business models such as Six Sigma must be explored.

Employing Six Sigma in Higher Education

As a result of the competitive nature of higher education, the quality of one's product is the utmost of importance. Higher education stakeholders have sought the expertise of Six Sigma to improve services and to process efficiency (Mazumder, 2014) to ensure that the needs of not only the institution are being met but that of key stakeholders. For many who are unfamiliar with the business side of an organization, Six Sigma is a data and results driven sequencing of events. According to Simons (2013), "Six Sigma helps identify and prevent errors and ensure that processes are able to deliver outputs that meet customer requirements" (p.1). In the educational arena, these outputs not only deliver results for the institutional consumer (e.g. the college) but also for the institutional product (e.g. the students). In essence, Six Sigma cuts the proverbial fat out of a multilayered system by finding a means to simplify structure without sacrificing quality through the realization of hard and soft reserves. Hard reserves can be equated to revenue that an institution obtains through recognized savings or generated income. An example of a hard reserve is revenue an institution obtains through cutting an academic program on campus. In contrast, a soft reserve is a perceived benefit an institution will incur that is not necessarily reflected in a financial statement. A theoretical example of a soft reserve in higher education would be the potential income a university will incur from being newly ranked in an academic newsletter (e.g. US News and World Report); or the potential income a university will generate as a result of a well-known celebrity being photographed wearing a t-shirt with the institutions name across it. From both examples, the global exposure of the institution could feasibly increase revenue with more aspirants vying to be admitted to the university; however, the institution may be hesitant at that moment to make increases to the budget for the current or looming fiscal year. Theoretically, the institution in both cases did not necessarily do anything different in their recruiting campaign but they were aided by outside sources with marketing.

For a deeper understanding of Six Sigma, Mazumder (2014) states:

> The term Six Sigma refers to the six standard deviations away from the mean in a normal distribution or bell-shaped curve. It uses the measurement of factors in a process and works on improving the output based on continuously improving the system and its processes (p. 5).

The Six Sigma platform was conceptualized by Motorola in the 1980s to improve products and their quality (Mazumder, 2014). The creation of Six Sigma led to the formation of Motorola University where its training principles not only supported its employees but those in other industries (Clift, Liptak, & Rosen, 2016). This manifestation of "corporate education" in accordance with Clift, Liptak, and Rosen (2016) looked at the relationship between how changing external environments influenced a unit's core. In higher education, these platforms have persuaded institutions to become proactive rather than reactive. Nonetheless, Mazunder (2014) attest that there can be several challenges to the quality of higher education such as endurance and conformance; however, through the use of tools like statistical process control, lean manufacturing, failure mode, and effects analysis institutions can narrow the margin.

Generally, the education field can be diffused into three components: administration, enrollment, and academics (Villanova, n.d.). The administration's objective is to provide key stakeholders like students, instructors, the institution, and future employers with an accomplished product (Shoeibi & Zahmatdoost, 2015) all while still managing the daily operations of grant

proposals, structural maintenance, and information technology (Villanova, n.d). Next academics, coupled with the institution and its instructors, seek to implement the best practices needed to transform the value of knowledge within the classroom (Villanova, n.d.). Lastly, the impetus for education, enrollment, would not occur without registered students. Through the use of Six Sigma, the enrollment process can be restructured to the benefit and satisfaction of the student. For institutions like Webster University, Six Sigma principles can be used to aid in marketing campaigns geared to attract potential students and faculty who are unacquainted with the university. Like many institutions in the United States, Webster University contains branch campuses in various locations throughout the world. For these sites to sustain in their various settings they are driven by enrollment; therefore, warm bodies are needed in classrooms to keep institutional doors open. Ideologies of Six Sigma can be used to develop comprehensive and integrated workflow processes that attract highly qualified and skilled professionals who can instruct scholars invocations (i.e. healthcare, business administration) that are in high demand in the surrounding region. Through yielding highly skilled and competent scholars, data from local markets can show the economic impact graduates from these branch campuses have on the region. This rate of return on the backend would then provide free publicity for the institution as a result of the rapport established with the local business community. This pride in the university's imprint on the local economy would, in theory, create and elevate alumni and staff morale as a result of the service they either received and/or are providing to the consumer.

For this to be possible, universities must strategically locate branch campuses and decipher traditional and non-traditional programming that would be suitable for that region. For instance, if a region is known for clean energy use, creating academic programming geared toward sustainable technology would be a more practical choice than creating academic programming centered around petroleum engineering. Traditional majors such as business and education would still be taught at these sites but academic programming that targets specific niche markets would not only generate jobs but also increase student enrollment as a result of the conceivable long-term financial benefit from majoring in said profession. Ideally, the same niche markets you are edifying would reciprocate the support and monetarily empower back into the branch campus. While in theory, these actions would cause branch campuses to flourish, implications for practice and research are needed.

Implications for Practice and Future Research

From the data, implications for practice and future research concerning the implementation of Six Sigma in higher education need to be addressed. At the forefront of the list is the durability of this model in regards to student enrollment. As noted earlier, student enrollment drives the institution. With novel computerized technology and branch campuses emerging annually, these venues attempt to replicate home campuses can be thwarted due to limited infrastructure (Altbach, 2010). In accordance with Altbach (2010), students may in turn favor more robust facilities with all the trimmings thereby causing student attrition. Ultimately, with the accumulation of more branch and online learning communities, competition for student demographics in parallel territories would conceivably cause institutions with smaller budgets to not withstand the influence of institutions with larger budgets.

Comparably, branch campuses must also be as selective as home campuses in regards to student matriculation. As branch campuses open internationally and more students join online learning programs, the question over selectivity becomes of importance due to the student body needing to reflect the population they are recruiting at the home campuses (Altbach, 2010). Inclusively, research shows there is no significant difference between online learning and

physically attending classes (Harrell, 2008). With that being said, as swiftly as branch campuses materialize across the world, the ease and convenience of online courses could easily cause these sites to become extinct. With the implementation of Six Sigma in this process, institutions could investigate challenges with student attrition and implement cohesive agendas for student retention.

Concluding Thought

Branch and computerized technologies are the new waves of higher education. As time increases, the ease and accessibility of some infrastructures may easily overshadow other domains. With the advancement of virtual technology, in the impending decades, the next dispute will be if main campuses and all their extending infrastructures (i.e. administration building, student union, departmental buildings) will be necessary. With the implementation of Six Sigma in higher education in conjunction with organizational productivity, the human element must be considered in the nexus of edification.

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